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RECENT PROGRESS OF USSR COAL-CLEANING PLANTS

EXPERIMENTS OF KIZEL BASIN COAL-CLEANING PLANT -- Moscow, Ugol', No 1, Jan 54

The Kospash Coal-Cleaning Plant at Mine No 24/38 of the Molotovugol' Combine is the first such plant put into operation in the Kizel basin by the Ministry of Coal Industry USSR. This plant made screen analyses of samples of coal from seam 9/5 of Mine No 24, seams 11/6 and 13/7 of Mine No 38, and a fractional analysis of class 50-6 millimeters of samples of these same seams from Mine No 39.

Two coal seams, 5 and 6, with a ratio in output of one to one were being mined by Mine No 24/38 during the period of adjustment of the plant; coal from these seams was examined for concentration possibilities. Coal from each seam was sifted in screens with openings of 100, 50, 25, 13, 6, 3, and 1 millimeters. Rock was removed from coal in the class above 100 millimeters. The coal was then crushed to 100 millimeters and later sifted in screens with openings of 13 and 6 millimeters.

Fractional analysis in solutions of zinc chloride and water, with a specific gravity of 1.5 and 1.8, were carried out with coal in the natural classes of 100-50, 50-25, 25-13, and 13-6 millimeters, and with coal 100-13 and 13-6 millimeters obtained by crushing coal of a size above 100 millimeters down to 100 millimeters. Data on the screen analysis of run-of-the-mine coal from seams 5 and 6 are given in the following table:

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Classes (mm)	Products	Yield (in %)	Ash Content (in %)	Sulfur Content (in %)
More than 100	Coal	7.14	20.15	3.6
More than 100	Rock	0.64	67.53	20.11
Total		7.78	24.04	3.69
100-50	Coal	10.29	27.99	6.51
50-25	Coal	17.22	27.62	6.16
25-13	Coal	20.50	28.8,	5.48
13-6	Coal	13.67	28.19	6.58
6-3	Coal	9.94	30.73	5.12
3-1	Coal	9.35	32.86	4.50
1-0	Coal	11.25	36.32	3.75
Total		100.00	29.49	5.37

The percent of ash content increases from the large-size classes to the smaller ones, reaching 36.32 percent in the class 1-0 millimeter. The very high ash content of the small classes is to be explained by the fact that part of the rock dust with a high ash content falls into the coal.

The total yield of machine-processed classes of coal of 100-13 and 100-6 millimeters, and the residue, including the crushed coal of the class above 100 millimeters, is given in the following table:

Machine-Processed Classes 100-13 mm

Classes (mm)	Yield (in %)	Ash Content (in %)	Sulfur Content (in %)
100-13	54.12	27.27	5.63
13-0	45.24	31.51	5.09
Total	99.36	29.22	5.38
Rock above 100 mm	0.64	67.53	20.45
Total	100.00	29.49	5.37

Machine-Processed Classes 100-6 mm

Classes (mm)	Yield (in %)	Ash Content (in %)	Sulfur Content (in %)
100-6	68.38	-7.40	5.82
6-0	30.98	33.26	4.43
Total	99.36	29.22	5.38
Rock above 100 mm	0.64	67.53	20.45
Total	100.00	29.49	5.37

Data on the fractional analysis of coal of machine-processed classes 100-13 and 100-6 millimeters are given in the following table:

Sp Gr of Fraction	Yield (in %) of Class	Yield (in %) of Run-of-Mine Coal	Ash (in %)	Summary: Floating Fractions Yield (in %)	Summary: Floating Fractions Ash Content (in %)	Summary: Sinking Fractions Yield (in %)	Summary: Sinking Fractions Ash Content (in %)
Class 100-13 mm							
Less than 1.5	58.61	31.72	14.24	58.61	14.24	40.79	42.62
1.5-1.8	20.80	11.26	27.69	79.41	17.76	19.99	62.23
More than 1.8	19.99	10.82	62.23	99.40	26.70	--	--
Total	99.40	53.80	26.70	--	--	--	--
Sludge	.60	0.32	36.76	--	--	--	--
Total	100.00	54.12	26.76	--	--	--	--
Class 100-6 mm							
Less than 1.5	57.88	39.58	14.04	57.88	14.04	41.24	45.19
1.5-1.8	20.78	14.21	28.17	78.66	17.77	20.46	62.43
More than 1.8	20.46	13.99	62.48	99.12	27.00	--	--
Total	99.12	67.78	27.00	--	--	--	--
Sludge	0.88	0.60	40.38	--	--	--	--
Total	100.00	68.38	27.11	--	--	--	--

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As seen from data in the preceding table, when coal of the class of 100-13 millimeters is grouped according to the specific gravity of 1.8, the output of concentrate amounts to 79.41 percent of the class with an ash content of 17.76 percent and a yield of tailings of 19.99 percent with an ash content of 62.23 percent. When the 100-6 millimeter class is treated in this way, the output of concentrate is 78.66 percent with an ash content of 17.17 percent and a yield of tailings of 20.46 percent with an ash content of 62.48 percent. Data in the table indicate that coal from Mine No 24/38 with a specific gravity of 1.5-1.8 falls into a category that is difficult to clean.

The theoretical balance of the products of coal cleaning, drawn up in accordance with the planned technological process, gives maximum possible qualitative-quantitative indexes of the products issuing from cleaning. The following table indicates comparative results from cleaning up to a depth of 13 millimeters and up to a depth of 6 millimeters.

Products	Separation According to Specific Gravity	Cleaning to 13 mm		Cleaning to 6 mm	
		Yield (in %)	Ash Content (in %)	Yield (in %)	Ash Content (in %)
Run-of-mine coal		100.0	29.51	100.0	29.27
Raw material in washing troughs		54.12	26.76	68.38	27.11
Fuel concentrate	1.8	42.98	17.76	53.78	17.77
Sludge		0.32	36.76	0.60	40.38
Washed rock	1.8	10.82	62.23	13.99	62.48
Rock more than 100 mm in size		0.64	67.53	0.64	67.53
Total rock		11.46	62.52	14.53	62.70
Residue		45.24	31.51	30.98	33.26

With the depth of cleaning coal up to 13 millimeters, the possible output of fuel concentrate amounts to 42.98 percent with an ash content of 17.76 percent and, with the depth of cleaning up to 6 millimeters, it amounts to 53.79 percent with an ash content of 17.77 percent. Consequently, in classifying coal according to a specific gravity of 1.8, the possible reduction in the ash content of fuel coal below that of run-of-the mine coal is 11.75-11.5 percent.

COAL-CLEANING PROCESS IN NOVO-UZLOVSKIY TsOF -- Moscow, Komsomol'skaya Pravda, 15 Jan 54

The Novo-Uzlovskiy TsOF (Central Coal-Cleaning Plant), one of the large TsOFs of the USSR, has mechanized all processes of coal cleaning completely. Coal from Gorlovka, Dzerzhinsk, and Pervomaysk are cleaned in this plant. Coal extracted in the mines goes through a long, complicated process before it becomes a concentrate for coke by-product plants. Lumps of coal float on water, turn somersaults in the air, as if they had lost all weight, and are even transformed into thick foam.

Broad belt conveyers carry the coal from railroad cars to the top of the many-storied building of the plant where enormous screens have been set up to screen the coal carefully. Part of it goes immediately to the cleaning shops but the large lumps are crushed in vibrating screens for convenience in handling.

These vibrating screens are the pride of the plant and have not been in use long. The young mechanic who designed and put these machines into use received a Stalin Prize for his achievement. The lumps of coal are broken up under the effect of perpetual vibration and acquire the necessary size. Then the coal is mechanically sorted and delivered by a number of chutes to aggregates which do the cleaning.

The plant includes a pneumatic cleaning shop which is provided with several complicated aggregates, separators, which remove rock from the coal with the aid of compressed air. This is a simple and economical way of cleaning coal. In one hour 200 tons of coal can be freed of rock. However, not every type of coal can be cleaned by this method. The main bulk of the coal coming to the plant is cleaned of rock mixtures by means of water.

In the process of cleaning coal much coal dust is formed, which is a very valuable product for coking. Although it is not hard to remove coal dust from air, the problem of removing it from water was unsolved for a long time. Soviet engineers have discovered a way to do this, and now the Novo-Uzlovskiy Coal-Cleaning Plant has a flotation shop for this purpose. Very fine particles of coal, not over 0.75 millimeter in size, are cleaned in this shop and all the water leaving the coal-washing machines is sent to the flotation shop so that its coal content may be extracted.

KAL'MIUSSKIY TsOF STEPS UP OUTPUT -- Moscow, Master Uglya, No 12, Dec 53

During the past year the flotation shop of the Kal'miusskiy Central Coal-Cleaning Plant of the Stalinugleobogashcheniye Trust increased its output 7 percent and, as a result, additional thousands of tons of coal have been sent to metallurgists.

The productivity of the flotation machines was doubled by improving the technology of the process and perfecting the design of certain parts of the machines. The flotation process was accelerated by the introduction of additional air into the pulp and the output raised from 6 tons to 10 tons per hour.

The filtration process was also speeded up by the use of steam to preheat the pulp of the flotation concentrate to 20 degrees in trough-shaped vacuum filters. This increased the porosity and decreased the viscosity of the concentrate. Furthermore, the water was removed more rapidly and the concentrate emerged with a lower moisture content.

To prolong the working period of the sieves of the vacuum filters, they were washed every 10 days with a 5-percent solution of hydrochloric acid, and their time of service was thus lengthened from 10 days to 2-3 months.

Work is now being done on increasing the productivity of the concentration cells of the flotation machines. For this purpose it was planned to introduce a batch of flotation reagents in such a way that they would reach each cell. This speeds up the process and improves the quality of the concentrate.

It is the responsibility of the senior flotation operator, a woman, to see that the five flotation machines driven by 35 motors are in steady operation. At the beginning of each shift she checks the condition of each motor. Then she checks the machines as regards their load of coal dust, water, and flotation reagents. There are norms for feeding coal dust, water, and flotation reagents to the machines as well as for a strict check of the gate valves. Observation of these conditions has resulted in a maximum output and high quality of the concentrate.

PRELIMINARY CLEANING BY SCRAPER CONVEYER -- Mosc , Master Uglya, No 12, Dec 53

In many mines partial cleaning of coal is effected by preliminary screening, followed by manual removal of rock. This procedure is hampered if the setup at the surface of the mine does not permit the setting up of screens. This was the case in Mine No 1-2 Livenka of the Stalinugol' Combine. Coking coal extracted by this mine was delivered to the belt conveyer without preliminary screening and, as a result, low-grade coal was shipped to the consumers.

The chief mechanic of the mine suggested using, instead of a screen, the SKR-11 conveyer with several changes in its construction. A number of small holes were made in the center of the upper chute of the scraper and two larger holes [illegible] lower chute. This enabled the scraper to function also as a screen. Fines from the coal which was fed to the scraper conveyer from the coal bunker passed through these holes and reached the rubber belt conveyer first, forming a layer of coal dust on which the large lumps of coal subsequently fell. This procedure had the following advantages: the large lumps of coal sliding along the rubber conveyer neither scratched nor tore it, rock removal was facilitated, and the quality of the coking coal was raised.

ACCUMULATION OF METHANE IN COAL BUNKERS OF COAL-CLEANING PLANTS -- Moscow, Ugol', No 4, Apr 54

Recently the escape of considerable amounts of methane was noted in coal bunkers of a number of coal-cleaning plants of the USSR. Such a case occurred in a dehydrating bunker [illegible]he TsOF of the Mine imeni Dzerzhinskiy in July 1952 and another more severe one in September 1952. Escapes of methane were observed also in bunkers of coal-cleaning plants of Mine No 13-bis and Mine No 6-6-bis of the Kadiyevugol' Trust.

It is known that when coal is mined underground only part of the menthane is released underground. A considerable part of it remains in the coal after it is delivered to the surface and it continues to be released for about 6 months.

Two scientists from the Makeyevka Scientific Research Institute (MakNII) investigated the coal dust and gas situation in Donbass coal-cleaning plants. It was discovered that during the time that coal remained in bunkers, usually 6-8 hours, the discharge of methane from the coal was very intense and accumulated in the area under the ceiling of the bunker in quantities apt to explode. In the dehydrating bunkers there was a more intense discharge of methane from wet coal than from dry. It was found that where there were ribbed reinforced-concrete ceilings for the bunkers methane was retained between the ribs, thus creating difficulties in ventilation. As a matter of fact, the Rules for Safety and the Norms for Planning Coal Cleaning Plants gave no directions for the ventilation of bunkers.

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Among the recommendations made by the scientists were flat ceilings for bunkers and natural or forced ventilation with forced discharge of the methane-gas mixture into the outer atmosphere.

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